

CLAIMS

1. A hologram screen for displaying an image by diffracting and scattering image light projected from an image projection apparatus, comprising:

5 a first light scattering device, placed on an image projection apparatus side of a hologram device in the hologram screen, for scattering light incident from a specific angle range; and

10 a second light scattering device, placed between the hologram device and the first light scattering device or on the image projection apparatus side of the first light scattering device, for scattering light incident from a specific angle range which is substantially different from the specific angle range of the first light scattering device, wherein

15 the specific angle range of the first or second light scattering device is set so that an incidence angle range within which the image light is incident on the hologram screen contains an incidence angle at which the image light is incident on the hologram screen.

2. A hologram screen as claimed in claim 1, wherein the specific angle range of the first light scattering device and the specific angle range of the second light scattering device each have an angle difference of 10° or greater from a vertical to the hologram screen.

3. A hologram display comprising:
30 a hologram screen for displaying an image by diffracting and scattering image light; and

a projection apparatus for projecting the image light onto the hologram screen, wherein the hologram screen comprises:

35 a first light scattering device, placed on an image projection apparatus side of a hologram device in the hologram screen, for scattering light incident from a specific angle range; and

5 a second light scattering device, placed between the hologram device and the first light scattering device or on the image projection apparatus side of the first light scattering device, for scattering light incident from a specific angle range which is substantially different from the specific angle range of the first light scattering device, wherein

10 the specific angle range of the first or second light scattering device is set so that an incidence angle range within which the image light is incident on the hologram screen contains an incidence angle at which the image light is incident on the hologram screen.

15 4. A hologram screen for displaying an image by diffracting and scattering image light projected from an image projection apparatus, comprising:

20 an upward/downward light scattering device placed on an image projection apparatus side of a hologram device in the hologram screen, and oriented so as to scatter light incident from at least one upward/downward specific angle range spreading obliquely upward or obliquely downward; and

25 a leftward/rightward light scattering device placed between the hologram device and the upward/downward light scattering device or on the image projection apparatus side of the upward/downward light scattering device, and oriented so as to scatter light incident from a leftward/rightward specific angle range spreading obliquely leftward and obliquely rightward, wherein

30 the upward/downward specific angle range contains an incidence angle at which the image light is incident on the hologram screen.

35 5. A hologram screen as claimed in claim 4, wherein when the leftward/rightward specific angle range is from γ leftward to δ rightward relative to a normal to

the hologram screen, γ and δ satisfy

$$0^\circ \leq \gamma \leq 25^\circ, 0^\circ \leq \delta \leq 25^\circ$$

6. A hologram screen as claimed in claim 4,
wherein when the leftward/rightward specific angle range
is from γ_1 to γ_2 leftward and from δ_1 to δ_2 rightward
relative to a normal to the hologram screen, γ_1 , γ_2 , δ_1 ,
and δ_2 satisfy

$$20^\circ \leq \gamma_1 \leq 25^\circ, 65^\circ \leq \gamma_2 \leq 70^\circ$$

$$20^\circ \leq \delta_1 \leq 25^\circ, 65^\circ \leq \delta_2 \leq 70^\circ$$

7. A hologram screen as claimed in claim 4,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device scatter at
least 20% of the light incident within the
upward/downward specific angle range and the
leftward/rightward specific angle range, respectively.

8. A hologram screen as claimed in claim 4,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device are both
placed within 5 mm of the hologram device.

9. A hologram screen as claimed in claim 4,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device are
detachable.

10. A hologram screen as claimed in claim 4,
wherein the hologram screen is constructed by joining
together a plurality of hologram devices arranged in two
dimensions.

11. A hologram screen as claimed in claim 10,
wherein all the plurality of hologram devices have
optically the same characteristics.

12. A hologram screen as claimed in claim 10,
wherein the plurality of hologram devices are recorded
using respectively different reference beams and
therefore have optically different characteristics.

13. A hologram screen as claimed in claim 4,

wherein the hologram screen is a transmission-type hologram screen.

14. A hologram screen as claimed in claim 4,
wherein the hologram screen is a reflection-type hologram
screen.

15. A hologram screen as claimed in claim 4,
wherein the hologram device is produced by recording a
diffusing plate.

16. A hologram screen as claimed in claim 4,
wherein the hologram screen is a computer hologram.

17. A hologram display comprising:
a hologram screen for displaying an image
by diffracting and scattering image light; and
a projection apparatus for projecting the
image light onto the hologram screen, wherein
the hologram screen comprises:
an upward/downward light scattering device
placed on an image projection apparatus side of a
hologram device in the hologram screen, and oriented so
as to scatter light incident from at least one
upward/downward specific angle range spreading obliquely
upward or obliquely downward; and

a leftward/rightward light scattering
device placed between the hologram device and the
upward/downward light scattering device or on the image
projection apparatus side of the upward/downward light
scattering device, and oriented so as to scatter light
incident from a leftward/rightward specific angle range
spreading obliquely leftward and obliquely rightward,
wherein

the upward/downward specific angle range
contains an incidence angle at which the image light is
incident on the hologram screen.

18. A hologram screen for displaying an image by
diffracting and scattering image light projected from an
image projection apparatus, comprising:

an upward/downward light scattering device

placed on an image projection apparatus side of a
hologram device in the hologram screen, and oriented so
as to scatter light incident from at least one
upward/downward specific angle range spreading obliquely
upward or obliquely downward; and

a leftward/rightward light scattering
device placed on an image observer side of the hologram
device, and oriented so as to scatter light incident from
a leftward/rightward specific angle range spreading
obliquely leftward and obliquely rightward, wherein
the upward/downward specific angle range
contains an incidence angle at which the image light is
incident on the hologram device.

19. A hologram screen as claimed in claim 18,
wherein when the leftward/rightward specific angle range
is from γ leftward to δ rightward relative to a normal to
the hologram screen, γ and δ satisfy

$$0^\circ \leq \gamma \leq 25^\circ, 0^\circ \leq \delta \leq 25^\circ$$

20. A hologram screen as claimed in claim 18,
wherein when the leftward/rightward specific angle range
is from γ_1 to γ_2 leftward and from δ_1 to δ_2 rightward
relative to a normal to the hologram screen, γ_1 , γ_2 , δ_1 ,
and δ_2 satisfy

$$20^\circ \leq \gamma_1 \leq 25^\circ, 65^\circ \leq \gamma_2 \leq 70^\circ$$

$$20^\circ \leq \delta_1 \leq 25^\circ, 65^\circ \leq \delta_2 \leq 70^\circ$$

21. A hologram screen as claimed in claim 18,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device scatter at
least 20% of the light incident within the
upward/downward specific angle range and the
leftward/rightward specific angle range, respectively.

22. A hologram screen as claimed in claim 18,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device are both

placed within 5 mm of the hologram device.

23. A hologram screen as claimed in claim 18,
wherein the upward/downward light scattering device and
the leftward/rightward light scattering device are
5 detachable.

24. A hologram screen as claimed in claim 18,
wherein the hologram screen is constructed by joining
together a plurality of hologram devices arranged in two
dimensions.

10 25. A hologram screen as claimed in claim 24,
wherein all the plurality of hologram devices have
optically the same characteristics.

26. A hologram screen as claimed in claim 24,
wherein the plurality of hologram devices are recorded
15 using respectively different reference beams and
therefore have optically different characteristics.

27. A hologram screen as claimed in claim 18,
wherein the hologram screen is a transmission-type
hologram screen.

20 28. A hologram screen as claimed in claim 18,
wherein the hologram screen is a reflection-type hologram
screen.

29. A hologram screen as claimed in claim 18,
wherein the hologram device is produced by recording a
25 diffusing plate.

30. A hologram screen as claimed in claim 18,
wherein the hologram screen is a computer hologram.

31. A hologram display comprising:
a hologram screen for displaying an image
30 by diffracting and scattering image light; and
a projection apparatus for projecting the
image light onto the hologram screen, wherein
the hologram screen comprises:
an upward/downward light scattering device
35 placed on an image projection apparatus side of a
hologram device in the hologram screen, and oriented so
as to scatter light incident from at least one

upward/downward specific angle range spreading obliquely
upward or obliquely downward; and

a leftward/rightward light scattering device placed on an image observer side of the hologram device, and oriented so as to scatter light incident from a leftward/rightward specific angle range spreading obliquely leftward and obliquely rightward, wherein

the upward/downward specific angle range
contains an incidence angle at which the image light is
10 incident on the hologram device.